

REMARKS

A petition for a two month extension of time has today been filed as a separate paper and a copy is attached hereto.

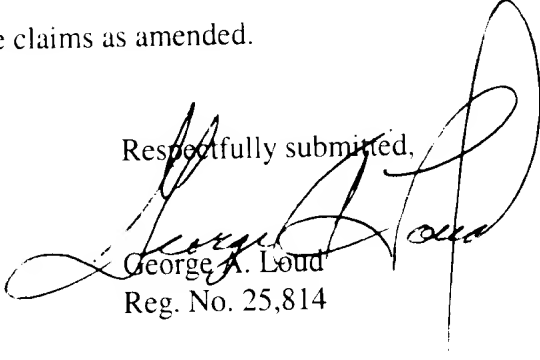
The rejections for anticipation respectively based on Maeda et al and Saito et al are respectfully traversed. The references (Maeda et al - U.S. 5,554,570), and Saito et al (JP08-236518) are directed to deletion of dependence of film formation by thermal CVD upon the nature of the surface on which the film is formed. The insulating films of the references are used as a base for the thermal CVD film formation. Further, Saito et al (JP09-134910) forms an interlayer insulating film, not a barrier insulating film. On the other hand, the present invention forms a barrier insulating film. The barrier insulating film according to the present invention has low dielectric constant and is superior in preventing moisture from permeating an adjacent interlayer insulating film. While Maeda et al (U.S. 5,554,570) disclose an example of forming a barrier insulating film on an interlayer insulating film, the insulating film sandwiched between barrier layers is different from that of the present invention. In the present invention the insulating film in contact with the barrier layer is an insulating film formed by a coating method, a porous insulating film formed by a plasma enhanced CVD or an SiOF film formed by a plasma enhanced CVD, while the insulating film is that formed by thermal CVD in Maeda et al (U.S. 5,554,570).

New claim 20 finds support, for example at page 17, lines 25-27 of applicants' original

specification. Neither Maeda et al nor Saito et al suggest use of such a high ratio of oxygen-containing gas/silicon-containing gas.

In conclusion, it is respectfully requested that the examiner reconsider the rejections of record with a view toward allowance of the claims as amended.

Respectfully submitted,



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1. (Amended) A film forming method for forming a silicon-containing barrier insulating film on a substrate comprising the steps of:

(a) preparing a film-forming [film forming] gas comprising, (1) at least [that consists of any] one member selected from the [a] group consisting of alkoxy compounds having Si-H bonds and siloxane compounds having Si-H bonds and (2) at least [any] one oxygen-containing gas selected from the [a] group consisting of O₂, N₂O, NO₂, CO, CO₂, and H₂O; [and]

(b) converting the film-forming gas into a plasma [forming a silicon-containing insulating film on the substrate by plasmanizing the film forming gas to react];

(c) contacting the substrate with the plasma to form the silicon-containing barrier insulating film on the substrate; and

(d) forming an interlayer insulating film on said barrier insulating film by coating or plasma enhanced CVD.

2. (Amended) A film forming method according to claim 1, wherein at least [any] one member selected from a group consisting of N₂ and H₂ is added to the film-forming [film forming] gas.

3. (Amended) A film forming method according to claim 1, wherein (1) is [the alkoxy compound having Si-H bonds is formed of] trimethoxysilane (TMS:SiH(OCH₃)₃).

4. (Amended) A film forming method according to claim 1, wherein (1) is [the siloxane having Si-H bonds is formed of] tetramethyldisiloxane (TMDSO:(CH₃)₂HSi-O-SiH(CH₃)₂).

5. (Amended) A film forming method according to claim 1, wherein parallel-plate type electrodes are employed as a plasma generating means, and wherein [, when a film is formed, a] high frequency power having a frequency of 100 kHz to 1 MHz is applied to an electrode on which the [a] substrate is loaded and [a] high frequency power having a frequency of 1 MHz or more is applied to an electrode opposing [to] the electrode on which the substrate is loaded.

8. (Amended) A semiconductor device manufacturing method according to claim 6, wherein said [7, further comprising the step of forming an] interlayer insulating film has a greater [, whose film] thickness [is thicker] than the barrier insulating [protection] layer[, on the protection layer, after the step of forming the protection layer for covering the wiring].